about Wilmington, Del. Heavy rain and hailstorms were reported in Lancaster county, Pa., and Harford county, Md. A heavy rainstorm caused much damage at and about Council Bluffs, Iowa. At West Bend, Iowa, a hailstorm did considerable damage in a path about ½ mile in width. An unusually severe rainstorm was reported at Helena, Ark., at night. A destructive hailstorm was reported near Ardoch, N. Dak., in the afternoon. Heavy rain in the mountains near Mount Pleasant, Utah, caused damage to bridges, etc. Flood, resulting from heavy rain in the mountains, was very destructive at Austin, Nev.

29th.—An exceptionally heavy rain and thunderstorm visited Wicomico, Baltimore, Harford, and Cecil counties, Md., in the morning, causing damage by flood. The storm was also severe in Delaware. Damage was caused to fruit and oats near Hudson, Mich., by a hailstorm. Heavy thunder, rain, and hailstorms visited the sections about Sulphur Springs, Storm Lake, and Alta, Iowa.

30th.—Severe thunderstorms occurred over Long Island and New Jersey. At Woodbury, N. J., lightning struck in several places. Very heavy thunder and rainstorms visited Williamsport and Carlisle, Pa., in the afternoon and evening. Heavy rain about West Point, Miss., flooded a part of that town, swept away bridges, and submerged cotton fields.

INLAND NAVIGATION.

FLOODS.

At Kansas City, Mo., the stage of water in the Missouri River was 23.1 feet, 2.1 feet above the danger-line, the morning of the 1st, and the streets of Harlem, on the opposite bank of the river, and surrounding small farms were under water. The river reached its maximum height during the day, and at 5 p. m. had fallen 0.2 foot. On the 2d the river had fallen 0.4 foot at Kansas City, and by the 4th it was below the danger-line. On the 6th the river commenced to rise at Kansas City, and the morning of the 7th it was 0.7 foot below the danger-line. On the 8th it was 0.3 foot below the danger-line, and nearly stationary, and by the 9th it had commenced to fall.

At Sioux City, Iowa, the stage of water in the Missouri River was 14.6 feet the morning of the 4th, the highest point reached this season, and large quantities of logs and drift were running, causing considerable damage to the construction work of the Pacific Short Line bridge. On the 5th the river was falling steadily at Sioux City.

A report of the 6th stated that the Missouri River had formed a new channel at Doniphan Point, one mile east of the one formed the preceding week, and that a number of valuable Missouri farms were submerged. The Missouri River cut its banks and changed channel at several points south of Pierre, S. Dak., during the month.

On the 8th and 9th high water was reported in the Kanawha River, W. Va., and tributaries, and several booms were broken, letting out great quantities of logs.

The new lake in the Colorado Desert, near Salton, San Diego Co., Cal., presented no material change during the month.

Heights of rivers above low-water mark, July, 1891 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River.						
Shreveport, La	29.9	1	16.9	31	3.5	13.4
Arkansas River.						
Fort Smith, Ark	22.0	31	15.2	25, 26	4.2	11.0
Little Rock, Ark	23.0	1	16.5	27, 28	6.1	10.4
Missouri River.						
Fort Buford, N. Dak	.....	18	14.7	31	11.8	2.9
Sioux City, Iowa	18.7	4	14.6	12	11.2	3.4
Omaha, Nebr	18.0	1, 5, 6	13.9	14, 25	11.1	2.8
Kansas City, Mo	21.0	1	23.1	19, 26	15.1	8.0
Mississippi River.						
Saint Paul, Minn	14.0	2	2.9	18	1.9	1.0
La Crosse, Wis	13.0	1–8	4.6	30, 31	2.4	2.2
Dubuque, Iowa	16.0	9	4.9	28–31	2.3	2.6
Davenport, Iowa	15.0	9, 10	3.4	30	1.2	2.2
Keokuk, Iowa	14.0	7, 12	3.6	31	1.4	2.2
Saint Louis, Mo	30.0	4	23.7	30	14.0	9.7
Cairo, Ill	40.0	7	24.6	31	14.0	10.6
Memphis, Tenn	33.0	1	19.4	31	10.9	8.5
Vicksburg, Miss	41.0	5–8	29.4	31	17.7	11.7
New Orleans, La	13.0	10	10.2	31	5.5	4.7
Ohio River.						
Parkersburgh, W. Va	38.0	12	12.8	4	5.2	7.6
Cincinnati, Ohio	45.0	14, 15	18.2	23, 24	9.7	8.5
Louisville, Ky	24.0	1	8.6	23, 24	5.5	3.1
Cumberland River.						
Nashville, Tenn	40.0	6	5.3	30	1.7	3.6
Tennessee River.						
Chattanooga, Tenn	33.0	31	5.7	18	2.7	3.0
Knoxville, Tenn	29.0	31	2.2	7, 14, 15	1.2	1.0
Monongahela River.						
Pittsburg, Pa	29.0	9	12.5	15	2.7	9.8
Savannah River.						
Augusta, Ga	32.0	31	12.6	5, 6	6.4	6.2
Willamette River.						
Portland, Oregon	15.0	1	11.8	31	6.7	5.1
Susquehanna River.						
Harrisburg, Pa	17.0	25	4.4	17, 18, 23, 24	2.0	2.4
Alabama River.						
Montgomery, Ala	48.0	11	4.8	5, 20, 23	1.5	3.3

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were reported as follows: 1st, East Machias, Me. 3d, Medford, Wis. 5th, South Canisteo, N. Y. 6th, Wolsey, S. Dak. 12th, Rockland, Mich. 14th, East Machias, Me. 17th, Peshtigo, Wis. 27th, East Machias, Me. 31st, Salem Corners, Pa.

THUNDERSTORMS.

Description of the more severe thunderstorms reported for the month is given under "Local storms."

Thunderstorms were reported as follows: East of the Rocky Mountains they were reported in the greatest number of states, 31, on the 28th; in 20 to 30 on the 2d to 4th, 7th, 14th to 18th, 20th to 27th, 29th, and 30th; in 10 to 19 on the 1st, 5th, 6th, 8th, 10th, 11th, 13th, 19th, and 31st; and in 9 on the 12th. There was no date for which thunderstorms were reported east of the Rocky Mountains in less than 9 states.

East of the Rocky Mountains thunderstorms were reported on the greatest number of dates, 30, in Florida; on 20 to 29 in Arkansas, Iowa, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Pennsylvania, South Dakota, and Texas; on 10 to 19 in Alabama, Connecticut, Georgia, Illinois, Indiana, Maine, Maryland, Michigan, Montana, New Jersey, North Dakota, Ohio, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin; and on 1 to 9 in Delaware, District of Columbia, Indian Territory, Kentucky, Massachusetts, New Hampshire, Oklahoma Territory, Rhode Island, and Vermont. There was no state east of the Rocky Mountains in which thunderstorms were not reported on 1 or more dates.

West of the Rocky Mountains thunderstorms were reported in Arizona on the 2d, 3d, 5th, 12th, 14th to 20th, 22d, and 24th to 26th; in California on the 4th, 10th, 23d, 25th, 27th, and 29th; in Colorado on the 2d to 7th, 12th, and 14th to 31st; in Idaho on the 10th, 16th to 19th, 22d, 25th, 26th, 29th, and 30th; in Nevada on the 1st, 2d, 6th, 18th, 20th, and 22d to 31st; in New Mexico on the 3d to 8th, 10th, 13th to 16th, 19th,

22d to 29th, and 31st; in Oregon on the 3d, 5th, 7th, 8th, 10th, 11th, 16th, 17th, 23d, 25th, 28th, and 29th; in Utah on the 3d to 6th, 15th, 17th to 19th, 21st, and 23d to 31st; in Washington on the 5th, 15th to 18th, and 23d to 25th; and in Wyoming on the 3d, 6th to 12th, 14th, 16th to 19th, 23d, 24th, and 26th to 31st.

MISCELLANEOUS PHENOMENA.

DROUGHT.

The month was very dry, and damage to crops by drought was reported over the greater part of lower Michigan, and in east-central South Dakota, southeast Kansas, south Texas, east Arizona, and northwest Washington. In the early part of the month drought conditions prevailed in parts of east Wisconsin, southern Indiana, southwest Illinois, and parts of Kentucky.

FOREST FIRES.

Destructive forest fires occurred in Chippewa Co., Mich., northern Wisconsin, in Marion, Santa Clara, and Tuolumne counties, Cal., and in the Olympic Mountains near Port Angeles, Wash.

VERIFICATIONS.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief of the Weather Bureau has authorized forecasts for 48 and 72 hours, covering the 2d and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications made for second day in advance. Number of predictions made: weather, 135; temperature, 28. Percentages of verifications: weather, 91; temperature, 85; weather and temperature combined, 90.2.

WIND SIGNALS FOR JULY, 1891.

Statement showing percentages of justifications of wind signals for the month of July, 1891.

Wind signals—(Ordered by Professor H. A. Hazen.)—Total number of signals ordered, 65; justified as to velocity, wholly, 39, partly, 2; justified as to direction, 61. All of the signals ordered were cautionary; 25 signals were ordered for easterly winds, of which 22 were justified, and 40 were ordered for westerly winds, of which 39 were justified. Percentage of justifications, 58.9.

No cold-wave signals were ordered, and no temperature-fall warnings were issued during the month.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Room.]

FORECASTS FOR 24 HOURS IN ADVANCE.

The forecasts for districts east of the Rocky Mountains for July, 1891, were made by Professor H. A. Hazen, Weather Bureau, and those for the Pacific coast districts were made at San Francisco, Cal., by 1st Lieutenant John P. Finley, 15th Infantry.

Percentages of forecasts verified, July, 1891.

State.	Weather.	Temperature.	Weather and temperature combined.	State.	Weather.	Temperature.	Weather and temperature combined.
Maine	88.7	68.4	80.6	Arkansas	83.2	74.5	79.7
New Hampshire	83.9	76.8	81.1	Tennessee	84.2	79.7	82.4
Vermont	86.5	69.0	79.5	Kentucky	90.6	82.9	87.5
Massachusetts	91.3	73.9	81.3	Ohio	91.6	81.9	87.7
Rhode Island	91.3	76.8	85.5	West Virginia	92.9	75.2	86.4
Connecticut	86.8	71.6	80.7	Indiana	94.2	81.9	89.3
Eastern New York	87.7	69.0	80.2	Illinois	89.4	80.6	85.6
Western New York	82.6	71.3	78.1	Lower Michigan	86.8	81.0	84.5
Eastern Pennsylvania	83.2	66.5	76.5	Upper Michigan	81.9	72.6	78.2
Western Pennsylvania	83.2	80.6	82.2	Wisconsin	86.5	75.2	82.0
New Jersey	79.7	65.8	74.1	Minnesota	90.3	70.0	82.2
Delaware	80.3	78.1	79.4	Iowa	89.7	81.6	86.5
Maryland	82.0	73.5	78.6	Kansas	83.2	73.5	79.3
District of Columbia	77.7	77.4	77.6	Nebraska	87.4	78.4	83.8
Virginia	83.9	77.4	81.3	Missouri	90.3	78.4	85.5
North Carolina	80.6	79.4	80.1	Colorado	89.4	61.6	78.3
South Carolina	86.8	78.1	83.3	North Dakota	88.1	82.9	85.0
Georgia	91.6	88.7	90.4	South Dakota	88.4	77.1	83.9
Eastern Florida	75.8	92.3	82.4	Southern California	98.7	91.0	95.6
Western Florida	85.2	94.5	88.9	Northern California	98.1	87.4	93.8
Alabama	90.0	88.4	89.4	Oregon	93.9	84.9	90.3
Mississippi	88.4	89.4	88.8	Washington	92.3	84.9	89.3
Louisiana	83.2	83.5	83.3				
Texas	88.7	83.9	87.1	Monthly percentage	86.4	77.7	82.9

In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. The forecasts of temperature in districts east of the Rocky Mountains for July, 1891, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for July, 1891, of the directors of the various state weather services:

ALABAMA.

Temperature.—The mean was 5.3 below the normal; maximum, 100, at Wiggins, 20th, and at Brewton, 1st; minimum, 50, at Camden, 19th; greatest monthly range, 41, at Camden; least monthly range, 22, at Chepultepec.

Precipitation.—The average was 1.37 above the normal; greatest monthly, 10.05, at Valley Head; least monthly, 1.89, at Fort Deposit.

Wind.—Prevailing direction, east.—*P. H. Mell, Observer, Weather Bureau, Auburn, director.*

ARKANSAS.

Temperature.—The mean was 4.6 below the average; maximum, 103, at Lead Hill, 22d; minimum, 50, at Fayetteville and Rogers, 9th; greatest monthly range, 50, at Lead Hill; least monthly range, 17, at Winslow.

Precipitation.—The average was 4.14 above the normal; greatest monthly, 12.86, at Hot Springs; least monthly, 2.10, at Lead Hill.

Wind.—Prevailing direction, southwest.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; F. H. Clarke, Observer, Weather Bureau, assistant.*

COLORADO.

Temperature.—Maximum, 102, at Fruita, 24th; minimum, 10, at Breckenridge, 2d; greatest monthly range, 75, at Breckenridge; least monthly range, 31, at Climax.

Precipitation.—Greatest monthly, 8.26, at Brandon; least monthly, 0.28, at Grover.—*W. S. Miller, Observer, Weather Bureau, Denver, director.*

ILLINOIS.

Temperature.—The mean was 5.2 below the normal of the last 16 years;